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## Martin Feinstein on the University of Bophuthatswana

# The many lessons to be learnt at Unibop

A stranger to the Northern Transvaal seldom knows when he is in Bophuthatswana or South Africa. The nationalist pan that stretched the independent homeland onto the map left six separate pieces, surrounded by strips of "white" South Africa.

"This is just one of South Africa's 'jumping grounds'—a rural enclave to support the migrant labour system's fragmented families. Amid such underdevelopment and poverty, what role is there for a university?"

Independence? In Pretoria's shadow means little more than a separate flag and emblem and the right to not the inclination to pass different laws. But if this has made an international oddity of the territory, it has enabled it to escape the apartheid laws enforced on South African universities and give birth to a university that will turn conventional ideas of higher education on their heads, cutting boldly across the concepts of liberal academia.

The University of Bophuthatswana (Unibop) opens officially on April 28 in the capital, Mafikeng, near Mafikeng, 300 kilometres west of Johannesburg and 150 kilometres south of Gaborone, capital of Botswana.

It is exciting because it is going to break many of the rules that South African universities have entrenched—not always willingly—end because it will be the first university in the country to plan from the ground up, for a third World situation.

It was born in the hearts of the Tswana, the main tribe, rather than the minds of education planners. By the mid-1970s a national fundraising campaign had made a start when, in August, 1978, eight months after South Africa granted the homeland independence—the new Republic's national education commission reported to Parliament, a university was a foregone conclusion. It remained only to be decided where it should be sited, what its academic priorities should be and how it should be structured.

Professor R. P. Lekgole, chairman of the Commission, recommended a university sited to the country's development needs; particularly its embryonic civil service, and culture—and dedicated to free enterprise.

"We have tried to educate our children in the European mould, but it should not automatically follow the pattern of the western, classical university but should look to the needs of the country," he said. The structure he envisioned, and which is now taking shape, was a central campus with colleges throughout the country.

"The university must form an umbrella body linking together all forms of tertiary education into one integrated system. Historically this might well prove to be the most profound and influential recommendation which will shape the whole future of the university and the effectiveness of its relationship to the needs and aspirations of the people."

The Mafikeng campus will start off with three schools: law, education and business administration. Already a college of agriculture exists. A college of health and welfare ministry has submitted its proposals for a college of health and nursing. The country's two teacher training colleges will become the first college of education.

Also planned is a college founded on technical education with the emphasis on mining, over half of the country's income comes from mining, mainly platinum, and the coalfields, and the country's 37 mines will be closely involved here.



Building for the future: a construction worker on the Unibop site.

Just how close is reflected in the appointment of Sir Albert Robinson, chairman of Rustenburg Platinum Mines Ltd and Johannesburg Consolidated Investments, as chancellor. Bophuthatswana's President Lucas Mangope, was offered the position but turned it down.

The university building is taking shape near the capital's two main roads, a quiet glass and concrete parliament and the Mafikeng Sun Hotel, one of several gambling and soft-porn spots in Bophuthatswana cashing in on droves of weekend tourists from apartheid South Africa.

It will only be completed in September next year, and until then lectures will be held in several renovated garages in a nearby housing complex. The administration operates from two small, hot and stuffy offices in Mafikeng, where the tutor, Dr L. Kriel, explained where the university is heading.

His goals are modelled on a great deal on the conclusion of the Association of African Universities 1972 "Workshop on creating the African University".

"The need for a higher education system dedicated to purely African needs and ideas, forbidden to hide from poverty behind the screen of academic freedom and devoted, above all, to development."

Innovation will mark Unibop's first few years while it adjusts to its as yet untapped and uncharted field. If, for example, the country needs a qualified agricultural technician, a college would take about three months to approve. The same operation in South Africa could take three years.

There are also thousands of prospective students without formal qualifications, and many potential graduates leave high school after three years (the standard 12 because of lack of money or classroom overcrowding). To exclude these would be to ensure Unibop's future as an elitist ivory tower—the last thing Dr Kriel wants, and every teacher who has experience will now enable them to register for education courses.

Even those who come to the university from abroad as one of the many will do so "from a non-academic, non-technological, non-quantitative background and with an affirmative rather than an achievement-oriented motivation".

For this reason, when lectures start, a great deal of time will have to be devoted to the basic skills of study and communication.

"The university," Dr Kriel says, "will plan its work on the basis of flexible responses to actual needs and be ready to provide reorientation programmes, courses to bridge the gap between school and university, because of the particular problems in finding sufficient students will adequate standards in mathematics and the sciences, the university will have a similar college for an specifically to provide university entrance with this competence."

This school university will be the first in the world which began near South Africa's human settlements Research Council and psychologist from Bophuthatswana's education department will join forces with Unibop to test annually and com-

sel all standard 10 pupils; a considerable effort, considering that there are six territories to cover.

Unibop has borrowed the "university" idea from Haifa University and Ontario's University of Waterloo. The campus never shuts down for vacations, but for a third of the year students are on the job. This leaves a standard eight-month academic year and cements the ethic of continual contribution that the university is so keen to instill.

"The university must not be allowed into an isolated university community, but in every aspect possible it should be part of the real community. Recreational, cultural and teaching facilities will not be university facilities, but will be open to the community," says Dr Kriel.

Sir Albert, the chancellor, agrees: "This university is unique in Southern Africa in its intent to involve students in the everyday life of the community by means of its three-term system. The third term will be spent by every student in an actual working situation, gaining experience from community life itself."

Dr Kriel is keenly aware of the bitter welcome that greeted the first few white postgraduate students at the "tribal" universities. They accused the white universities of using their institutions as convenient dumping grounds for second-rate academics. How will Unibop respond to white students?

Yes, they will be admitted, and one has already applied for undergraduate study. But they will be treated as "foreigners" and their fees will be higher, although it hasn't been decided how much. Fees for local students will be pitched slightly lower than most white universities.

Each and every student will receive a bursary which will cover about half the costs of a degree or diploma. Unibop does face the danger of becoming a convenient dumping ground for the South African-sponsored bureaucracy and South African-controlled industries. The hard facts are that South African taxpayers indirectly paid for most of Unibop's subsidy for 1980-81, and economic growth on the scale envisaged by the white would like to see it hardly likely.

South African business and government interests are well represented on the university's 15-man governing council. They include:

- The right-wing former rector of the Rand Afrikaans University, Professor Gerrit Viljoen, until recently leader of the arch-conservative secret Broederbond Society and now minister-general of South West Africa.

- The Anglo-American corporation M. C. O'Dowd, who is also chairman of the Free Market Foundation—an organisation committed to fostering a black middle class.

- Sidney Press, millionaire chairman of the giant Edgars Group.

- Dr H. J. Reynolds, chairman of the Maymow Board, which implements labour policy.

- Dr K. B. Harshorne, a former top official of the Department of Education and Training, is also a member, along with a sprinkling of academic and civil servants from both countries.

Unibop is committed to producing entrepreneurs, not socialists, and most of those men are there to make sure that it does.

If Dr Kriel and his colleagues can keep their mind continually oriented towards the management structure and create one if it is absent. They are keen on the institution's safety policy, and if it is unsatisfactory they will give it priority.

## Living dangerously with the Safety Act

### David Jobbins on health legislation

The universities and colleges could be forgiven for any anxieties when the 1974 Health and Safety at Work Act opened up their doors to the Factories Inspectorate for the first time.

The inspectorate was vested with sweeping powers to spring visits on institutions, structure, equipment, notices to stop practices it considered dangerous, and to bring legal action if it thought fit.

This potential threat to the universities' hallowed autonomy rested in the hands of people as versed in the ways of factories and heavy industrial plants as they were unfamiliar with the way education institutions worked.

The inspectorate was fully aware of the gap between industrial and educational activities. What it did not know was the complexity of the management structure within universities and the way it affected health and safety. For its first task it set about an investigation of this framework and the general characteristics of universities and colleges.

It admitted that unfamiliar problems would be found. In particular, safety precautions traditionally part of enforced practice in factories might seem irrelevant or even downright obstructive to enthusiastic research workers.

The inspectorate had also to contend with the question of the status of students, who are equally exposed to the hazards but do not have the same legal rights to protection enjoyed by employees. However, universities have what the inspectorate calls considerable duties under the 1974 Act to make sure students' health and safety is not endangered, and that premises used by students and plant and materials provided for them are safe and free from health risks.

The bulk of the inspection has been since the inspectorate began a five-year inspection in 1978.

A pilot scheme was carried out at six universities to work out the ground rules, and great care was taken to reassure the university authorities that, while their employees deserved no less protection than other workers, the difference between a university and a factory were recognised.

"We did not know about the way the universities work and tick," said Mr Harry Cavanagh, the senior inspector responsible for educational institutions. "What we needed was basic information."

The inspection programme is in schedule, with universities and colleges taking priority because of the greater potential risks compared with schools.

The inspectorate acknowledges that the universities' commitment to the welfare of their employees did not begin with the 1974 Act.

"I think they have always had an interest," Mr Cavanagh said. "It is implicit in the whole concept of care in loco parentis."

The Health and Safety at Work Act is just another extension of the universities' statutory and civil duties.

The first priority has been to get educational managements to reassess "old attitudes". What resistance the inspectorate has found was due to entrenched feelings that academic autonomy was being challenged.

Mr Cavanagh rejects suggestions that the older universities are proving the most resistant while the newer foundations have necessarily been better attuned to health and safety.

"It is not so much the type of establishment or where it is, but the person in charge. We are coming to a question of personalities. Some will give way before the inevitable while some will resist to the end."

If the person in charge is interpreted as a force of headway.

The first objective of the visits is to ensure that an adequate safety policy exists, and that the management structure has been designed to deal with health and safety requirements.

"We are moving towards greater co-operation. Inspectors try to identify the management structure and create one if it is absent. They are keen on the institution's safety policy, and if it is unsatisfactory they will give it priority."

be prepared to phase things, so this is no different from what is happening in industry.

There is a lot which can be done without committing large sums of money, Mr Cavanagh says.

He is anxious to stay out of controversy over the implications for health and safety of economic and social changes, with the staff ratio under consideration as a number of polytechnics.

Provided there is the right of training there is not the necessity for immediate supervision, but health and safety of students have our student per teacher, so we do not want to get involved in this one if we can avoid it. It is better to leave it to the professional judgment of the lecturer. Now fully they will know. It could be very dangerous if we started laying down rigid rules and regulations.

Mr Cavanagh illustrated the inspectorate's general approach by outlining the attitude adopted at benzene.

"In industry we have said this is a suspected carcinogen, and we accept its use as a cleaning solvent because something can be found to do the job just as efficiently but which is less harmful."

But if the purpose is educational, and someone wants to study the properties of benzene itself, we are not so ready to say that may not be a satisfactory solution.

"If, however, we saw it being used as a solvent in a university, we would say that something else should be obtained."

While it is impossible to be too centrally-collected data, universities are not as hazardous as the factory inspectorate might have been given for expecting.

Serious incidents such as at Birmingham smallpox outbreak are fortunately few, so far between. The pilot study reported in 1978 that university safety advisers said there were many "near misses".

"It is perhaps worth speculating whether it is because there are many competent and trained staff around in the laboratories that these minor accidents do not become major ones," the report continues.

It analysed 127 accidents at Strathclyde in 1975 ranging from the trivial to the potentially lethal. Of these 25 caused absence of work for more than three days. Three occurred during a university work-related activity, and included a number attributable to footballers.

Technicians seemed the most at risk, with breakage of glass being a frequent cause of injury. Maintenance staff and cleaners also showed a high incidence of injury, many of their accidents were due to circumstances peculiar to university premises.

Mr Cavanagh is sceptical about suggestions that initiative and experiment will be the financial burden of the Act. He argues that if the cost of implementation is really so high, a little care can have been done in the past and health and safety would therefore be particularly dangerous places in the university's statutory and civil duties.

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Shanghai students—numbers are expanding.

## Healing the wounds inflicted by the Cultural Revolution

Shanghai Second Medical College is a institution of contrasts. On one side a rather shaky undergraduate course that is only just recovering from the traumas of the Cultural Revolution and its aftermath; on the other a high quality staff and a high level of research, reputation in medical research.

The college was founded in 1952 but its constituent parts had much longer histories. It incorporated the medical school of St John's University, an American foundation, and of Aurora University, founded by the French, as well as a Chinese medical college and Shanghai's School of Dentistry.

The city of Shanghai was perhaps the spiritual home of the Cultural Revolution and certainly the power base of the Gang of Four. So an institution such as the medical college with high educational standards and western links was in an exposed position.

Dr Wang Li-Ben, the school's director, explained that the school had been damaged as a capitalist reader, and although a soldier in Mao Tse-tung's Fourth Army before the revolution he had been forced to stand "with his head low" from morning to night.

He was severely bullied and beaten "I have experienced what a fascist dictatorship is like," he added. But Dr Wang emphasised that only a small proportion, no more than 2 per cent of the staff and students at the school had been involved in the Cultural Revolution.

He was called a "bandit-like thing" and was criticised for looking forward instead of looking back.

Unfortunately the educational wounds inflicted by the Cultural Revolution have been slow to heal. The school has been slow to heal these physical wounds. The school has been slow to heal these physical wounds.

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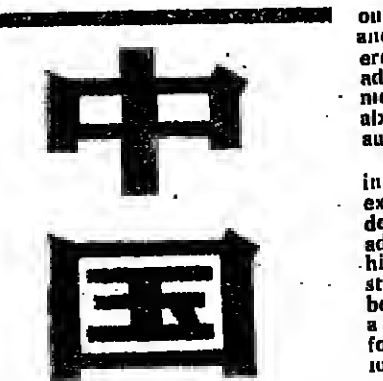
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Peter Scott's series on China continues with a visit to Shanghai Medical College

These doctors were now being called back to the college for a special one-year course to upgrade their knowledge.

Another problem was that not only was the course too short but students did not have to pass an examination to enter it when they graduated. Dr Wang said that their quality had been "very, very low", and a senior colleague, Professor Chang Tzu-Hsi, agreed. He said the very few had been any good and that some had only had a primary education. But, he added, they had usually been enthusiastic.

Perhaps in reaction to the collapse of standards between 1966 and 1978, the college is now determined to reestablish high and traditional standards as quickly as possible.

Although no students will graduate from the lengthened five-year course until 1982, it seems to have been remarkably successful in this—but at the cost perhaps of hasty learning.

Dr Wang calls it a "restoration", and restoration with its connotation of something being brought back to its original state seems an appropriate word to describe what has happened at Shanghai Second Medical College.

The time devoted to the more theoretical pre-clinical part of the course has been increased by two and a half times, while the clinical course has been lengthened by only six months and medical practice remains the same.

Mr Chang said that during the Cultural Revolution period students had paid far too much attention to practice and too little to theory. Now students have to pass the staff university entrance examination in basic sciences and chemistry (as well as political science and a foreign language); competition is fierce with 15 applicants for every place; they do not go into hospital until the beginning of their third year and little emphasis is placed

## Hilary Wilce reports on a country with an impossibly large student population

# Egypt's numbers pyramid

hundred of students repeating the year, that would bring his intake up to about 200.

University admissions are centralised and seem almost wilfully designed to produce an imbalance of graduate classes. They are run on a packing order: pupils with the highest school-leaving marks study medicine; those with the next highest marks study science or engineering; and at the bottom of the faculty ladder come low, commerce and education.

Social and economic pressures ensure that all students take up their allotted places in the hierarchy, no matter what their personal preferences. As a result Egypt has an oversupply of doctors, while teachers are poorly qualified and motivated.

Radical student politics remain the province of the few. Those on the left are outweighed by those clinging to behind such Islamic fundamentalist groups as the Muslim Brotherhood. Some observers can see an increase in the numbers of students wearing traditionally modest Muslim garb, but others dispute this; and university teaching staff and where point out that such allegiances have as much to do with general anti-Sadist, anti-Western attitudes, as with hurril-line religion.

Mennouille government officials remain full of lethargic, under-employed graduates, while the country suffers from a desperate shortage of technicians. Upgrading the technical sector has become one of Egypt's top priorities.

Students can either go to a three-year or a five-year technical school at 16, or go on to a two-year specialised technical institute after completing secondary school.

This shortage of skilled labour, and the fact that so many Egyptian technicians and skilled craftsmen head off in search of higher wages in the rest of the Arab world, has pushed demand up dramatically. It is as hard to find a good plumber in Cairo as in Croydon, and the fees charged are not dissimilar.

Five hundred and fifty thousand students crowd into the country's 12 universities. Five years ago there were only 250,000 students.

This numbers boom has inevitably led to falling standards and appalling teacher-student ratios. Last year the medical profession threatened to withdraw recognition of medical degrees from Cairo university, which has 130,000 students and is the most prestigious in the country, unless conditions improved.

Seven new provincial universities were established in the 1970s, but their facilities are still under construction. At Zagazig University in the eastern delta much of the campus is still a building site, while staff and students get by as best they can.

At Zagazig, as elsewhere, university staff are pressured to take more students than they think fit, since all pupils with the requisite number of marks in the school-leaving certificate are entitled to free university education.

Dr Kamal Joud, dean of the engineering faculty, explained that, while he might request 50 first year students, he could be asked to take an additional 40 or so "special cases"—perhaps students whose fathers had died in the war, or whose parents worked at the university, and then another 100 students from the local province. With a

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During the past six months a Save Adult Education Campaign has been mounted in order to generate political pressure against the widespread cuts in adult education by local education authorities. As a result of pressure on local politicians, a number of policy decisions have been modified in various parts of the country, but a disturbing trend has been established in that almost all the L.E.A.s now expect non-vocational adult education to be financially self-supporting.

Typical cases require class fees to be set at levels such that teaching, travelling, publicity, administrative and accommodation costs shall be covered. The input of public money is, therefore, being reduced almost to zero and the criterion of a successful class programme will be the ability to balance the books.

One education committee chairman in the Midlands has gone so far as to herald as a cultural revolution the fact that adult education has now been converted into a business. Organizations are charged in the L.E.A. in question, are now free to arrange whatever classes they wish, provided that students will pay for them. What was formerly a publicly financed sector of education is, therefore, being moved into the market place.

No other public sector has so far been treated in this way, but the new policies on adult education represent a significant departure from the spirit of the 1944 Education Act and from the well-established tradition of publicly provided education at all levels and of all kinds.

What is happening in adult education can, therefore, be seen as a significant change of principle. What seems to be at stake is the implicit principle that educational provision should be shaped by educational considerations rather than financial ones. This does not mean that money does not matter, but priorities within a given budget are decided on educational grounds and

## Adult education: the scapegoat of market-place economics

Expecting non-vocational courses to be financially self-supporting is against the spirit of the 1944 Act, says

Kenneth Lawson

not on the basis of whether or not a given number of courses are sufficiently popular to attract a given amount of fee income.

The traditional view sees education as a matter of public concern and as something worthy of public support. On the present evidence, adult education is being treated not as an exception to this principle.

Moreover, the principle of an equal right of access to adult education, irrespective of the financial status of students, is being further weakened. It has long been breached by the imposition of fees, but in most cases these have been nominal. They are now rising to levels which are becoming a deterrent to many people, and when all other cuts are rising, expenditure on education will become a lower priority in many family budgets.

It must be asked, therefore, whether adult education should in the present time be given such a low public priority that it is left to market forces, no-one can judge with certainty what will happen, but it is likely that what survives will be the more popular activities, irrespective of whether or not they are the most important, and they will be engaged in by the more affluent members of society.

It is easy to understand why adult education is being treated so exceptionally. The service relies heavily upon part-time staff who can be recruited and dispensed with at quite short notice and this makes it a simple matter to contract and expand provision as circumstances dictate. Contracts are usually issued subject to satisfactory enrolment for a given course and there are few costs incurred in cancelling a contract if classes fail to recruit. Additional contracts can readily be issued in order to meet unexpectedly large demands.

Such a system has its strengths and makes for flexibility. It is also relatively cheap compared with organizations employing large numbers of full-time staff. It is this feature, no doubt, which led Dr Royce Boyson to say recently in the House of Commons "that expenditure on adult education is one of the most purposeful and productive aspects of all education expenditure".

The system also has its weaknesses which because of its flexibility can be readily adopted to changes in the market situation. This flexibility has made possible the massive reductions in provision in counties such as Humberside, West Glamorgan, Hampshire and Nottinghamshire, last autumn.

The reliance on part-time staff also deprives adult education of strong trade union support. Its staff is not on the whole unionised in respect of part-time employment, although many individuals may be members of unions connected with full-time jobs elsewhere than in adult education. But in any event, union membership is largely irrelevant in the context because threats of strikes are likely to have little impact.

In addition, adult education is not compulsory and the 1944 Education Act does not specify either the quantity or quality which is to be provided. For many people, too, adult education is seen as of far less importance than the education of children. For all these reasons, therefore, adult education appears to be a soft option from the political point of view, which can be manipulated easily without putting voters at risk or so it has seemed.

What has been a surprise in recent months is the strength of feeling engendered by the cuts and the increase in adult education and their students. In some areas at least, have come to recognize that adult education is being made a political scapegoat, then a political response is necessary.

By making full use of local press and radio, a quite unprecedented

public response has been learned is that elected representatives are influenced by efficient numbers of people motivated to write letters to their MPs.

It has been demonstrated such letters can have an effect. It has also been shown that protest need not be strenuous and what matters is a demonstration of the fact that a significant number of people care about the issue.

What the Save Adult Education Campaign is attempting to do is to raise awareness of the importance of adult education as a part of the total educational system and mobilization of the public in writing letters to their MPs and persuading politicians. The latter is being done at the local level and at the national level.

The formatist last December on All Party Parliamentary Campaign is regarded as an important forward. Adult education is much a local matter but representation at Parliamentary level is vital and there are now new MPs and members of the House of Lords who have appeared, partly, while 12 to 15 at meetings of the group.

No one pretends that the fight for adult education is a simple one. It is still weak for many of the reasons given and in financial terms the weight of L.E.A. opinion has to be shifted to support the principle that it is important and that adult education is a necessary service which they believe in. Present trends cannot be reversed, they might be halted, not then the end of adult education as a public service may be.

The author is assistant director of the department of adult education at Nottingham University.

## Case for a Ministry of Science

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In basic science and technology the Minister would oversee the activities of the research councils, especially those of SRC, encouraging research and cooperation with industry of relevant departments of universities and polytechnics, and other collaborative schemes (e.g. teaching companies and exchange of personnel). There he would play an important part in improving standards of research in higher education which are suffering from the present policies of the DES. He would be able to commission reports such as on desirable numbers, training and career prospects of Q&E's. Being outside the DES he would be better placed to press for changes in our university system which are hindering projections, e.g. for increased mathematics content in our school curricula and in the training of primary teachers.

He would be responsible for a much needed new attitude to basic and technological research in universities and polytechnics. He would reverse the decisions of the DES in 1977 to restrict to zero growth the budget of SRC and the more recent decision to cut in real terms. He would reinforce that failure adequately to support research in universities not only hampers basic science, but does severe damage to our technological effort as well. Not only is there no sharp dividing line between "basic" and "applied" research, or for that matter between "basic" and "applied" scientists—a project in polymer science was referred to recently as "basic applied research"—but the pursuit of basic research projects has an enormous influence on the recruitment of young scientists and technologists.

It is often the British involvement in space physics, astronomy and other imaginative projects that originally attracts the young school leavers into the fields of high-speed electronics, material sciences and computing. Moreover, some of the best scientists have whose work is to train technologists, many will be lost to this country if they are not given the opportunity to follow up interests which may not be immediately applicable to industry. They are certainly not discouraged in this country or attracted to British universities or polytechnics by their salaries or other working conditions which are now further deteriorating.

If the present 100 staff to students ratio is lowered still further the universities will find it impossible to produce graduates in under less than three years and the same time run postgraduate courses or research projects many of which are of relevance to industry.

Even before the present series of cuts the Huxford Production Report (October 1978) drew attention to the demoralization and disillusionment of young potential scientists and engineers caused by a lack of career structure in higher education. It needs a separate Minister, committed to research and technology who would give a lead, sustain the morale of the young scientist or engineer and create for him a suitable climate.

There is an argument that even in spite of financial problems the national effort in basic science and technology as represented in our universities and polytechnics should not only not be cut back, but that there is a case for moderate expansion. The success of US technology can be related directly to an expansion of their science basis in the 1930s, even during the depression, which formed the foundation of the energetic investment in industry when the need and the opportunity later arose.

In this country before the present crisis we had only just begun to create such a basis, after relying for too long on "striding and sailing" methods. Surely we should enable industry to build on it and not dismantle its foundations.

The existence of a Ministry of Science and Technology overseeing basic and applied research and development and the training and career structure of scientists and engineers is a necessary but insufficient condition for the transfer of the results of R and D into industry. That this transfer is not effective enough has been the topic of many articles in the press; of ministerial statements complaining about the "missing link" and has been the subject of a report of the SCST also. It seems that there is more than one reason for this failure.

### The role of the production engineer is paramount

The first stems from the limitations and the widespread application of the Rothchild principle. This principle works well enough in an actual project in industry or in a laboratory, a problem arises which requires R and D to be done. In this case the problem is probably well defined, and since the consumer has asked for its solution it is presumably anxious to use the results of this exercise.

However, this procedure has led to difficulties and frictions; e.g. in the DES there have been disagreements between the Government, scientists and the research council committees (concerning suitable stipends) about the ethical priorities in other words about what the consumer really wanted, and the Rothchild principle. The working of the Rothchild principle.

Yet, provided the Rothchild principle is properly preserved and evolved by IOST,

they probably can be usefully applied to short term and limited projects, e.g. to solve solutions or a positive and not too expensive. Industry will probably make use of them without much prodding. Secondly, the speed and flexibility with which new trends are identified and developments introduced in firms or whole industries depends on management's response and willingness to make the necessary capital outlay.

In this response and the ability to identify problems which need solutions, the role of the production engineer is paramount. It seems that we do not possess production engineers of high quality in sufficient numbers; certainly there is evidence that top managements in British industry fail to recognize the importance of production engineers and fail to encourage their training and to provide a satisfactory career structure for them.

Thirdly the creation of ACARD proved that more is required than a Rothchild-type procedure where new and large scale technologies have to be planned for which there is, to start with, no "consumer". Since the survival of our industries must be based on new technologies, the technology element of these new technologies by ACARD is the proper procedure and the Minister of Science and Technology would base his decisions and recommendations on the cabinet on its findings.

Industry will, of course, always be free to make its own assessments, but it is clear that only very large firms, e.g. in the chemical or electrical industry or some nationalized undertakings, can do so. But very few industries indeed can make large investment plans in new technologies without Government assistance.

Because profits which should pay for new technology will normally be long in coming and even then might not be sufficient to pay for new developments, some firms, e.g. in the aerospace or microelectronics industry, will not Government help for long time to come. This is perfectly well understood in the United States, where government defence contracts supply this support or in Japan where industry is supported by loan agreements with banks who are only once removed from government. All advanced countries are looking for ways to transfer of advanced technology into industry, and Britain can be no exception only at her peril. With the overview of R and D transferred to MOST, a major role of DSI will be to encourage industry and to provide finance to advanced technology.

The SCST report makes a number of recommendations concerning education and training of Q&E's and a stronger interaction between R and D resources in the education sector and productive industry; and the Government's reply shows how many of these recommendations are being acted upon. But the evidence submitted to the committee, beyond some of the main causes of the breakdown in the transfer of technology from British industry, which militates against effective technology transfer.

This is borne out by the evidence of an executive of a fairly large firm who cites some of his graduate intake and yet is able to give a figure of the number of graduates who are employed. Another executive is quoted as saying that Q&E's standing would be unsuitable for the needs of British firms; yet there is ample evidence from the United States, Germany, even British industry that such support can be eminently successful.

The practice in many British firms to penalize the bright young graduates here SCST quotes comparative figures of the low percentage of graduates on the boards and the even lower percentage of those with a degree in science or engineering. Completion of the incentive of those with a degree in science or engineering to join industry in this country is low in all other countries where are our own. This is the climate in British industry is conditioned by a lack of suitable Q&E's, technicians in middle management, on the boards, and by a paucity of good production engineers.

### Both industry and government should play their part

It is a pity that the Huxford report is necessary to devote so much space to an almost self-evident thesis that production engineers, like members of other professions, cannot be trained in less than four or five years, but has few suggestions in the report about how to put this into effect.

There can be no doubt that in Britain we have the brains and skills and human potential to make the necessary technological advances, but both industry and government must play their part. The missing link between research and production technology is essentially a problem of the right investment in the new technology. It means investment in highly qualified young people, and in research and development, and in the processes. In industry this failure to invest is often caused by a failure to recognize the long-term benefits of research and development, or by a failure to invest in the capacity or unwillingness to invest in flow considerations to finance the development of a new technology. The Government's duty is to encourage industry to invest in research and development and to ensure that the necessary technology is transferred to industry.

The author is a 1979 lecturer in the Leeds University.

## BOOKS

### The testing of mental bias



Arthur Jensen.

individual. Thus it follows that the study of test bias is only concerned with measurements of phenotypes, and we are told that he is not "concerned with inferred genotypes in this inquiry". This reluctance to deal with the genotypes by means of the proportion of phenotypic variance attributable to genetic factors is rather strange. Could it be that a full scale defence of  $h^2$  with respect to IQ is now no longer possible? To be fair Jensen still claims that:

Estimates of  $h^2$  (i.e. broad heritability, which includes all of the genetic variance) for various standardized tests of intelligence vary from about .50 to .90 in different samples and populations, with a central tendency close to .75.

However, he now recognizes that there are a number of theoretical assumptions involved in estimating  $h^2$  by any of the several most common methods, and in practice it is rarely the case that the data meet all the assumptions underlying any one method.

and contends that: although there is general agreement among most behavioral geneticists that the heritability of intelligence is substantial, there is much less agreement about the precise level of heritability of IQ. It is an entirely satisfactory estimate. In any particular study one can always find methodological reasons for one's doubt.

Yet he leaves us in little uncertainty about evidence converging from the many studies so that "it would be difficult indeed to make a case for the hypothesis that the heritability of IQ is less than .50".

Converting to percentages it suddenly looks as though putting it crudely and lumping in any cover-up of the heritability of IQ is not only 50 per cent hereditarily and 50 per cent environment. It must be noted of course that this estimate is a within population one and says nothing about the causality involved in the difference between the means of two different populations.

Jensen clearly appreciates that the calculation of  $h^2$  for IQ scores is a highly technical and complex affair involving the principles and methods of quantitative genetics. He has written a book which is a technical treatise on the subject, and it is not surprising that it is a highly technical and complex affair. Jensen's views are presented in a highly technical and complex manner, and it is not surprising that it is a highly technical and complex affair.

But recent papers in Nature by Alan Watts of Oxford Polytechnic criticizing the assumptions made by Jensen in deriving his heritability formulae, are ignored, as is the provocative account by Feldman and Lewontin (1975) of the "heritability hang up". Readers are told that a whole book is required to do justice to the controversy, and that they may feel that Jensen could have spent his time more fruitfully performing that task rather than singling out the question of bias.

It is impossible to review a book that is so technical and complex without singling out the controversy associated with the name of the late Sir Cyril Burt. Especially when the author himself has been in an obituary notice, it is not surprising that Burt would have appeared on the list of names. But the controversy surrounding Burt's work is a highly technical and complex affair, and it is not surprising that it is a highly technical and complex affair.

One should also bear in mind the fact that Burt's work is a highly technical and complex affair, and it is not surprising that it is a highly technical and complex affair. Burt's work is a highly technical and complex affair, and it is not surprising that it is a highly technical and complex affair. Burt's work is a highly technical and complex affair, and it is not surprising that it is a highly technical and complex affair.

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completely makes no difference to the conclusions to be drawn from what is a very large and respectable body of evidence.

Yes, there are other more reliable sets of data than those published by Burt, but so far as the ratio of hereditary variance to the environmental variance is concerned, the data are in good agreement. In the British Journal of Educational Psychology a figure of 75.25, which does not differ greatly from that of Burt's 80.20. Goursley also concludes that:

Burt's solutions in respect of the hereditary-environmental problem were on the whole much sounder, than those of many of his critics. Also, one must make allowance for the fact that he was a pioneer in the study of heritability of IQ; most of the more sophisticated analyses in the field came after his early work.

On race differences Burt emphasized the enormous overlap between groups in the frequency distribution of IQ scores. If Jensen is not making a frontal defence of his 1969 position, he is doing it throughout the book by the use of a subtle method. One thought continually recurs as one intrepids battles with the almost overwhelming mass of mental measurements reported.

In chapter four he discusses the distribution of mental ability. For IQ scores it usually approaches the normal curve, even where the test items are not specially selected (rebutting those who deviously designed to produce a "privileged elite"). There are departures from normality at the lower and upper ends of the scale, but these have never proposed a satisfactory alternative function for the distribution. The production of separate norms for different racial groups is opposed on the grounds that it would be an extreme practical measure of conversing babies. What, then, do we know about the IQ distribution for the black and white populations of the United States? It is revealed on page 98 that "standardized intelligence tests of practically every description show an average score for the black population of about 100, and for the white population of about 100, with over 90 per cent of the published studies reporting differences between 2.30 and 11.0, which on the IQ scale (with  $\sigma = 15$ ) is between 10 and 20 IQ points, with a mean of 15 IQ points difference."

The only published data showing the average IQ of the black population is from the 1,800 black children from the Southern States. There is a significant difference between the means of the two groups, but the distributions overlap. Could these differences be largely caused by environmental effects? Jensen certainly admits that those can occur:

Large shifts in IQ are traceable in some cases to rather drastic changes in the child's environment, such as moving from an orphanage to a good adoptive home, or losing the parents, or marked changes in family circumstances that may affect interest and opportunities for intellectual development.

If the environmental effects are put down to "cultural bias" for example, differential exposure to words, concepts and books, then test performance will reflect these experiences if the tests are biased in the sense of favouring one group rather than another. It is necessary to do empirical studies to determine whether the criticized tests do in fact show evidence in terms of "objectivity defined criteria".

If the tests are unbiased and differences are still obtained between racial groups, then the differences would be ascribed to innate causes. But it does not logically follow that they need be solely innate. There could still be environmental effects in action, mediated by, for example, nutritional differences, and the general level of arousal produced by external stimulation. Nevertheless, "bias" as such, could not be upheld as the major cause of differences if the tests are shown to be "objectively unbiased".

Definitions and criteria of test bias are set out in chapter nine. Three concepts which might only appear to be related to bias are: damage to being wholly fallacious; these are, first, the egalitarian fallacy (assuming equivalent intelligence across all human populations), second, the culture-bound fallacy (the idea that items in a test can be rejected as biased by cultural imposition), and third, the standardization fallacy—understanding a test as a population, does not mean that the test is biased for members of another population.

Obviously, Jensen goes for the statistical definition of bias as "systematic errors in the predictive validity of test scores of individuals that are associated with the individual's group membership". Similarly, he uses "discrimination" in a neutral statistical manner and wants us to see that "no other overtones" should be read into it.

If the term "bias" is blessed if two people belonging to different characteristic groups obtain the same IQ score, which then predicts an identical external criterion measure, on a different scale for each of them. For example, if IQ scores for blacks

and whites were plotted against Grade Point Average, the scores should be described by a single regression line so that there is no systematic under or over prediction for either group. A true shooting procedure is outlined for detecting the sources of error in biased tests. The conclusion is that:

most standard ability and aptitude tests... are not biased for blacks and whites with respect to criterion validity and that the little bias that has been found in some studies has been in a direction that actually favors the selection of blacks when the selection procedure is colour blind.

So IQ tests are unbiased in this psychometric sense, but one is left with the nagging doubt that this finding says very little about the environmental differences between blacks and whites.

Chapter 13 deals with sex bias and Jensen enthusiastically highlights the inadequacy of studies which employ such samples: "It requires a sample size of at least 985 of each sex to detect a one IQ point difference." The largest study of IQs over (on Scottish children in 1952) failed to show a difference in mean IQ between the boys and the girls.

Throughout the book there runs an approach to intelligence which owes much to the work of Charles Spearman, indeed Jensen enthusiastically accepts the encapsulation of "g" as the general factor to "educational and correlates" which enters into all test performance. Intelligence is identified with "g" and to the extent that a test orders individuals on "g", it can be said to be a test of "g". He also supports Spearman's extraction of "g" from the intercorrelations of different mental test scores: "Because all measurements of intelligence are positively intercorrelated, they all share some general factor." This "g" factor is identified with the first principal component in the statistical routine for its analysis, but will not concern matters. Most statistical psychologists will be rather surprised to see the return of "g" with such a vengeance, for since the work of L. L. Thurstone it has been realized that the description of a person in terms of a limited number of reference abilities is mathematically arbitrary.

Anyway, some attempt is made to hunt for "g" throughout the animal kingdom and to identify it with possible brain processes. One hopes that measurements of the value of electrical potentials will be "unbiased" and it is tempting to equate "cognitive power" with "neural efficiency". Research in this area is tricky, to say the least, but some suggestive results have been obtained using Average Evoked Potentials.

In chapter 15 on the "Uses and Abuses of Tests" Jensen draws out some of the wider implications of his work and discusses the relation of general intelligence to society. He argues strongly for the contradiction of racism, philosophy, which imposes controls on people only because of their racial origin, by the facts of differential psychology. These "facts" include the possibility of a genetic component in racial differences (i.e. black-white) IQ differences, but as he lets slip in a note on page 58 this possibility is highly disputed and is generally regarded by geneticists as a scientifically legitimate but unproved hypothesis.

Further, he is convinced that the practical applications of psychometrics can help to reinforce the democratic ideal of treating every person according to his own merits. Individual characteristics rather than according to his or her sex, race, social class, religion, or national origin. He will be joined in this view by those psychologists who still believe that psychological tests are essentially a democratic method of selection.

To conclude, Jensen's book is an outstanding contribution to the literature of mental testing, and will force the debate on differences in intelligence back from the political to the scientific level. It is a book that should be read by all who are interested in the testing of mental bias.

R. E. Rawles, lecturer and departmental tutor in psychology at University College, London.











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## BOOKS Landmark historian

Truth in History  
by Oscar Handlin  
Harvard University Press, £10.50  
ISBN 0 674 91025 7

At the age of eight Oscar Handlin knew that he would become an historian. By his mid-twenties this determination had taken him from Public School 48 in Brooklyn to a doctorate at Harvard which, published as *Boston's Immigrants*, subsequently became recognised, as Professor Maldwyn Jones has declared, to constitute "a landmark in American historiography". Unlike those scholars whose early brilliance has been emphasised by subsequent silence, Professor Handlin, from his Harvard base, has in a variety of capacities maintained a constant output of publications of which *Truth in History* is the latest but not, one trusts, the last. If finally can be envisaged, that is a consequence of the collection in this volume of materials and writings assembled end in part published over the last forty years. During that period Professor Handlin has thought, read, expounded, and debated at considerable length aspects of the nature of historical writing and research. This process is illustrated in the 17 essays he has now printed or reprinted.

For better or worse—and arguments could be offered to sustain either position—the impression left by many of the papers is less that of disinterested wisdom than of belligerent partisanship. Professor Handlin does not believe that in his time the historical profession in the United States has gone from strength to strength; rather he sees it as having grown greatly both in size and in capacity to distort the interpretation of the past. His remarks on this question occur in a number of essays, from which it can be gathered that he regards the period before 1941 as providing a climate of personal academic contact and inspiring graduate teaching, but that thereafter the system was not destroyed but was since he found teaching and learning en-

joyable for at least a decade after 1945. If a particular event marked the announcement of an end of accepted standards it was the publication in 1961 of William Appleman Williams's *Contours of American History*. All in all, Handlin's review of Williams concluded that an academic outrage had been perpetrated. The study was a "total disaster", created from a "pervasive wrongheadedness that distorted every page". This judgment, to his amazement, did not dispose of the matter. In consequence, "I continued to write about the abysmal quality of a work of historical scholarship; whereas those who objected to the criticism defended a manifesto of the revisionist school critical of American foreign policy". The real issue, he discovered, was not history but the politics of the Cold War. Academics were using scholarly materials for improper purposes and before long "the trickle of revisionist writings... had swollen to a stream". This despite the fact that the "goodness" was inherently absurd; it flew in the face of all the evidence. Diplomacy was not the only aspect of American history in which Handlin found himself at odds with new interpretations: the Populists, as seen by some younger scholars, displayed biological beliefs and ambitions which he deemed could be sustained by reference to their writings or outlook. Before long, however, these specific controversies were overtaken by more general questions of method and purpose stemming from the writing of American history and the corporate behaviour of American historians. Against this background developments in the 1960s and 1970s provided little, if any, ground for academic celebration and applause. Fogel and Engerman's pioneering class analysis of slavery, *Time on the Cross* did not win the approval Professor Handlin's approval. His grounds for dissent are extensive and substantial but, as seems often the case in these essays, come coupled with reproaches of other scholars for their over-ready acceptance of the findings. Nor does his

Peter Marshall is professor of American history and lecturer at Manchester University.

## High politics in the Irish church

The Roman Catholic Church in Ireland and the Fall of Parnell, 1880-1891  
by Emmet Larkin  
Liverpool University Press, £16.00  
ISBN 0 85323 164 8

Professor Emmet Larkin has now published the second volume of what he calls his history of the Roman Catholic church in Ireland in the nineteenth century. Like the first, however, it is not so much a history of the church as an analysis of the high politics of the church, and especially its relationship with the Home Rule movement. Parnell in 1891: Larkin's familiarity with the private papers of many of the protagonists in this political relationship enables him to present what he calls a "mosaic" of the ideas and manoeuvres of the Irish hierarchy as it picked its way through the minefields of Irish nationalism and Papal diplomacy.

This historical technique of allowing the documents more or less to speak for themselves has two advantages he claims for it: immediacy and authenticity. But it also has the risk of making the book appear more like a collection of edited papers than a work of historical analysis; and there are times when the reader, faced with the contents of letters from one bishop to another which cover, as many as three or more pages, could wish that the author had adopted a more orthodox approach.

Still, the project never gets out of hand—Larkin is too able and too happy to add the book is a remarkably thorough and definitive study of the politics of the Irish Roman Catholic church at a critical moment in its history. Larkin argues that the clerical alliance, whose origins he traces to 1880, heavily weighted the scale of the nationalists. The hierarchy was anxious about the direc-

tion in which the nationalist movement was heading, especially its aspirations to "Irishisation" and boycotting; yet it was unable to do anything about this for fear of offending Irish public opinion. The bishops' deteriorating power involved them in difficulties with England within its diplomatic fold, was proving itself willing to pursue the Irish church to condemn publicly those nationalist tactics which it abhorred privately. This the bishops dare not do; and just before the revelations of the Parnell-O'Shea divorce case the clergy were in no doubt that, as far as the "politics" were concerned, while Catholicism and nationalism might be synonymous, the church itself was very much on auxiliary to the Home Rule movement. The Parnellite "book" of their religion from Rome but their politics from home; and John Dillon and William O'Brien defied both Rome and the Irish hierarchy with impunity.

This subject occupies the first and, by far, the most interesting part of Larkin's book. The second part, dealing with the fall of Parnell, is, as is usual, but only because Larkin is the victim of his own industry and enthusiasm. He has already published a number of papers on this subject in various periodicals, and this book is really a fuller version of ideas and material previously presented. However, Larkin's thesis is worth re-stating, especially his assessment of the role of the church in the political campaigns; he avoids the extremes of overstatement and understatement of clerical power offered on the one hand by traditional interpreters, and on the other by some recent Irish historians. His analysis of the hierarchy and the newspaper press is especially pertinent. The press always seems to have argued the special interest of the clergy; Cardinal Logue, even confessed to being "in the lead" in his own words.

Some of Larkin's general observations are more debatable, especially his views on the Parnellite "facto state", and on British policy in Ireland after Parnell's fall. His assertion that the Irish independence movement never again attempted to establish an Irish state, would certainly have surprised Lloyd George. He conducted a protracted and bitter struggle to secure Ireland's recognition as a sovereign state, first of the United Kingdom, and then of the British Commonwealth.

And there are substantial differences between the "de facto" Irish state of 1879-1891 and the "facto state" of 1891-1921. The apparatus of state power was by no means complete in 1891, and the British government never again attempted to establish an Irish state, would certainly have surprised Lloyd George. He conducted a protracted and bitter struggle to secure Ireland's recognition as a sovereign state, first of the United Kingdom, and then of the British Commonwealth.

D. G. Boyce is lecturer in politics at University College, Swansea.

## BOOKS

### Warm and faithful portrait

Sherrington: his life and thought  
by John C. Eccles and William C. Gibson  
Springer International, DM134  
ISBN 3 540 09063 0

Sir Charles Sherrington, OM, GBE, President of the Royal Society from 1920 to 1925, Nobel laureate, with honorary doctorates from more than 20 universities, was born in 1857 and died in 1952 at the age of 94 years. He may reasonably be regarded as the greatest biologist since Darwin; and he did for the nervous system what William Harvey had done for the cardiovascular system, his *The Integrative Action of the Nervous System* (1906, reissued in 1947) being comparable with Harvey's *De Motu Cordis* (1628). But he was more than one of the greatest physiologists of all time: he was a philosopher whose Gifford lectures, *Man in his Nature* (1940), are a masterpiece.

Sherrington made clear to his own and to others who were privileged to visit him in his last years in Bathwick, that he wanted an extensive biography. He had in particular some long-standing biographies of two of his life-long friends (written by two friends), in each of which the picture of the man was obscured by a fog of detail. And he guessed who might be writing the biography to do this to him.

Therefore he might have had qualms at reading the first words of the preface to this book: "So much has been written about the scientific contributions of Sherrington that the man himself, and his thoughts, have been largely overlooked. More and more, students of history are calling for creative writing on the who's who, particularly when he is a genius". Further, the dust-jacket tells us that "this book will remain the definitive Sherrington biography for many years to come".

Seen after his death, Sherrington appeared, and in this book too, as a "Selected References" list, a man who was not only a great scientist but also a great writer. The book is a masterpiece of Sherrington's writings.

Gibson writes, perhaps too

briefly, of Sherrington's great study of the must learned physician of the sixteenth century, The *Endeavour of Jean Fernel*, and more widely of Sherrington as a scholar of the history of medicine and a bibliophile. Gibson also has a splendid chapter on Sherrington as a poet. Seventeen appendices conclude the book. One is Sherrington's hilarious account of Grindrod in Viterbo, 1887, published in 1939. But we are not given the as yet unpublished account by Sherrington of a day in a Birmingham silk factory. He worked there as a labourer in the summer of 1915 when he was 57, doing a daily shift of 13 hours and nine on Sundays; the foreman offered a testimonial to help him get a job.

When the Second World War broke out he was over 80 and plagued by rheumatism, but was found on the roof of the Royal College of Surgeons in London cheering on the Spitfires; there is no mention of his stirring broadcast to France in 1944 (he was an excellent linguist).

The book ends with the *Memories of Sherrington's son*, printed for private circulation in 1957 and containing some details that differ from those given elsewhere in the book by the authors. There are a few other mistakes and omissions: the two-page letter from Flaxey in Oxford to Sherrington in 1911 is given in facsimile, dated 2 Aug 1912, by Flaxey but said by the authors to be 1941 (when Flaxey in fact was across the Atlantic). But with so good a portrait of this great scientist and philosopher who was also a scholar and poet and a splendid man who commanded respect and affection, one need not cavil at minor faults of husbandry. The book will be read by all serious students of physiology for years to come; it should also be available in student libraries so that young students can know in it and gain inspiration.

Hugh Sinclair

### Achievements of the quark model

An Introduction to Quarks and Partons  
by J. C. Close  
Academic Press, £26.40  
ISBN 0 12 175 150 3

The study of particle physics centres on the elementary particles of subatomic size, which are considered to be the fundamental units of matter. Particles postulated as taking part in the strong interactions—holding the atomic nucleus together—are called hadrons; and the hadrons are thought to be made up of smaller constituents called quarks and antiquarks. Particles postulated as taking part in the weak and electromagnetic interactions—involved in certain decay processes—are called leptons.

In the dust-jacket of this book it is pointed out that there is a major gap between the quark model and the experimental facts. It is indeed remarkable, in view of the extent to which this model has dominated thinking in high-energy physics during the past fifteen years, that this is the first book documenting the successes and failures of the model since that the old and new spectroscopic techniques, it is ironic that those areas of the old light-hadron spectroscopy which first led to the quark model, are much less developed than the new heavy spectroscopy which emerged after the "November revolution" of 1974. The reasons for this are the relativistic nature of the light quark wavefunctions and the increased strength in gluon coupling which also makes the quarks so hard to detect experimentally.

As a result a variety of group theoretical devices to discuss transitions were developed before 1974 without invoking explicit model wavefunctions. In my view these are largely superseded by

explicit dynamical calculations as shown for charm quarks in the last section. Indeed, it is shown in the first part that the successes and failures of the group theoretical methods are best understood from a dynamical viewpoint. It seems unfortunate that such a long, and rather difficult, account is given in a graduate text on these methods.

This criticism apart, the book gives a very comprehensive survey of the quark model up to 1977. It particularly enjoyed the chapter on the central section on the neutron model very lucidly presented. Inevitably the development since 1977 means that some of the details look a bit dated; charm quarks look free of difficulties now, some of the details in a quantum chromodynamics framework, and so on. None of this, however, prevents the reader from obtaining an excellent feeling for the quark model from this book.

From the viewpoint of the graduate reader, with some background in particle physics, the text should provide few difficulties (rather than the many mentioned above). For the graduate only in quantum mechanics, some more specific references would be helpful, particularly in some of the more field theoretical results used. An extensive bibliography and references are given, but they could still prove daunting without guidance; to an undergraduate, as a graduate text, however, and as a record of the achievements of the quark model of hadrons, this book is a most useful acquisition for any library.

David Sutherland

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### The faceless mass

Science in Chains: the crisis of science and scientists in the Soviet Union today  
by Mark Popovsky  
Collins/Harvill, £8.95  
ISBN 0 00 262761 2

Mark Popovsky is a scientific journalist who left the Soviet Union in 1977. Many books and articles by him have been published in the Soviet Union. In particular, one lengthy article published in 1966 played an important role in the public rehabilitation of Nikolai Vavilov. Thus, Popovsky was a close observer of the Soviet scientific community in the mid-1960s when it strove to assert a degree of independence.

During these years Lysenkoism was overthrown and genetics re-established as a field of research. Many scientists also protested against moves to rehabilitate Stalin. It was the response of the scientific community to the tightening of political and ideological control over science from the late 1960s which led the author to write this book, the manuscript for which was completed in Moscow in 1966.

For Popovsky, Soviet scientists have, in the 1970s, been a disappointment: he sees them as a faceless mass, which has compromised with the "system", ducked its moral responsibilities and looked on science as nothing more than a well-paid livelihood. Soviet science has continued to advance in the field of nuclear physics, but science, the law "uniquely" of Soviet scientists being seen partly as a reflection of the attractiveness of science as a career.

Institutions are run by bureaucrats who get their staff to write their dissertations and articles. Further down the chain as a result of the policy of ensuring that each individual has its scientific cadres.

Robert Lewis

Robert Lewis is lecturer in economic history at the University of Exeter.

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# Classified Advertisements Index

## Appointments vacant

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## Universities



Applications are invited for the following posts, for which applications close on the dates shown. Salaries (unless otherwise stated) are as follows: Professor £42,500; Associate Professor £32,500; Senior Lecturer £22,500; Lecturer £17,500; Senior Tutor £14,500; Tutor £11,500. Further details, conditions of appointment for each post and application procedures may be obtained from the Association of Commonwealth Universities, 10, Golden Square, London, W1P 0PP.

The University of Tasmania  
**CHAIR OF PSYCHOLOGY**  
Applications are invited for appointment, which will become vacant as the retirement of Professor J. A. Gibson on 31 October, 1980.  
The present proposal salary is £26,000 p.a.

The Flinders University of South Australia  
**CHAIR OF POLITICS**  
Applications are invited from scholars with 'interests in any one or more of the following areas: a Chair of Politics in the School of Social Sciences. The interests of the chair will be in the following areas: Australian politics, international politics, comparative politics, development studies, international politics, political sociology, political theory. Enquiries of an academic nature may be directed to Dr. J. A. Gibson, Head of the School of Social Sciences, Flinders University, Adelaide, SA 5001.

University of Melbourne  
**SENIOR TUTOR**  
**AUDIOLOGIST**  
Applications are invited for this position in the Department of Otolaryngology of the Royal Victorian Eye and Ear Hospital, Melbourne. Duties include: teaching and clinical work in the University's Postgraduate Diploma in Audiology and 2.20 in Audiology. Candidates must have a 2.2 in Audiology and a postgraduate qualification in audiology. Enquiries should be sent to the Chair of Otolaryngology, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

**SENIOR LECTURER**  
(continuing) in the LAW SCHOOL  
The University of Melbourne is seeking a senior lecturer in the Law School. The successful candidate will be responsible for teaching and supervising students in the areas of contract law, tort law, and property law. Enquiries should be sent to the Chair of Law, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

**RESEARCH FELLOW**  
Applications are invited for appointment as a Research Fellow on a 21 year project funded by the Commonwealth Department of Health, which will investigate the effects of a high salt diet on blood pressure. The successful candidate will be responsible for the design and execution of the project. Enquiries should be sent to the Chair of Medicine, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

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The Australian National University  
**POSTDOCTORAL FELLOWS**  
The School proposes to appoint up to five Postdoctoral Fellows in the field of Chemistry. The successful candidate will be responsible for research in the field of Chemistry. Enquiries should be sent to the Chair of Chemistry, Australian National University, Canberra, ACT 2601.

The University of Melbourne  
**SENIOR TUTOR**  
**AUDIOLOGIST**  
Applications are invited for this position in the Department of Otolaryngology of the Royal Victorian Eye and Ear Hospital, Melbourne. Duties include: teaching and clinical work in the University's Postgraduate Diploma in Audiology and 2.20 in Audiology. Candidates must have a 2.2 in Audiology and a postgraduate qualification in audiology. Enquiries should be sent to the Chair of Otolaryngology, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

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**LECTURER IN FOREST ECONOMICS**  
The University of Melbourne is seeking a lecturer in the field of Forest Economics. The successful candidate will be responsible for teaching and supervising students in the field of Forest Economics. Enquiries should be sent to the Chair of Forest Economics, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

**SENIOR LECTURER**  
(continuing) in the LAW SCHOOL  
The University of Melbourne is seeking a senior lecturer in the Law School. The successful candidate will be responsible for teaching and supervising students in the areas of contract law, tort law, and property law. Enquiries should be sent to the Chair of Law, University of Melbourne, Parkville, Victoria 3010. Applications close on 30 June, 1980.

## THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF CHEMICAL TECHNOLOGY  
**LECTURER 1/2 (LEVELS 14, 17)**

The Department conducts degree programmes in both Food Technology and Mineral Technology, and it is expected that the successful applicant will have qualifications in Chemical Engineering and be involved in teaching Chemical Engineering fundamentals as they apply to either of these courses. Experience in either the Food Technology or Mineral Technology would be an advantage.

## DEPARTMENT OF MATHEMATICS

**LECTURER 1/2 SENIOR LECTURER (LEVELS 14, 17, 19)**

The Department of Mathematics is primarily a service department teaching Mathematics to students of engineering, surveying, applied science, architecture, accountancy and business studies. The Department also offers a Postgraduate Diploma in Engineering Mathematics and a First Degree in Mathematics or Engineering. The successful candidate will be responsible for teaching Mathematics to students of engineering, surveying, applied science, architecture, accountancy and business studies. The Department also offers a Postgraduate Diploma in Engineering Mathematics and a First Degree in Mathematics or Engineering.

## DEPARTMENT OF MECHANICAL ENGINEERING

**LECTURER 1/2—(LEVELS 14, 17)**

It is desirable that applicants should have degree-level teaching experience in one or more of the following subjects: Strength of Materials, Mechanics of Solids, Engineering Materials, and Engineering Design. Preference will be given to candidates who have relevant industrial or research experience.

## SENIOR TECHNICAL OFFICER GRADE 1/3 (LEVELS 8, 10)

A Technical Officer (as required in the Department of Mechanical Engineering. His duties will include construction and maintenance of teaching and research equipment. Applicants should preferably have general engineering/electronics experience and should be able to train staff in these areas. Additional experience in the Mechanical Engineering field would be an advantage.

## UNIVERSITY OF PAPUA NEW GUINEA (PORT MORESBY)

Applications are invited for the following posts:  
a. SENIOR LECTURER/LECTURER IN BASIC DENTAL SCIENCES to have overall responsibility to the Professor of Dentistry for the co-ordination of teaching in Anatomy, Dental Anatomy, Physiology and Biochemistry. Preference will be given to a candidate with an additional clinical teaching interest. Research funds and facilities are available in all of the above disciplines.  
b. SENIOR LECTURER/LECTURER IN ORAL MEDICINE to be responsible to the Professor of Dentistry for the teaching of Oral Medicine. The appointee will also be expected to assist in the teaching of General and Oral Pathology. Preference will be given to a candidate with wide clinical experience. Research funds and facilities are available in all of the above disciplines.  
c. SENIOR LECTURER/LECTURER IN ORAL MEDICINE to be responsible to the Professor of Dentistry for the teaching of Oral Medicine. The appointee will also be expected to assist in the teaching of General and Oral Pathology. Preference will be given to a candidate with wide clinical experience. Research funds and facilities are available in all of the above disciplines.

## UNIVERSITY OF RHODESIA

Applications are invited for the following:  
**LECTURESIPS / SENIOR LECTURESIPS**

## INSTITUTE OF ADULT EDUCATION

As part of a development programme, the Institute seeks to recruit a number of lecturers to teach in the following areas: science, health, social studies, and general education. The successful candidate will be responsible for teaching in the following areas: science, health, social studies, and general education. The Institute seeks to recruit a number of lecturers to teach in the following areas: science, health, social studies, and general education.

## INSTITUTE OF EDUCATION

In addition to a strong school science teaching record and ability to initiate research, applicants should offer leadership in one or more of the following areas: science, health, social studies, and general education. The successful candidate will be responsible for teaching in the following areas: science, health, social studies, and general education. The Institute seeks to recruit a number of lecturers to teach in the following areas: science, health, social studies, and general education.

## UNIVERSITY OF SINGAPORE

**University Secondments**

With the cooperation of the Inter-University Council for Higher Education Overseas, the University of Singapore is seeking to attract a limited number of senior academic staff to secondment in the field of teacher education. The successful candidate will be responsible for teaching in the following areas: science, health, social studies, and general education. The University of Singapore is seeking to attract a limited number of senior academic staff to secondment in the field of teacher education.

## MURDOCH UNIVERSITY

Perth, Western Australia  
**STATE ANIMAL RESOURCES CENTRE for Western Australia**

Murdoch University, on behalf of the Project Committee, is seeking applications for the following position which is available immediately:

## DIRECTOR

The Centre is to be based on the Murdoch campus, Western Australia south of Perth and will supply high quality laboratory animal services to all Western Australian institutions. Construction commenced in 1979 and is scheduled for completion at the end of 1980. The successful candidate will be responsible for the management of the Centre. The Centre is to be based on the Murdoch campus, Western Australia south of Perth and will supply high quality laboratory animal services to all Western Australian institutions.

## Universities continued

## THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

COMPUTER STAFF  
The PNG University of Technology is looking for a new Computer system in 1980 for installation in 1981. At present it operates on ICL 2803, a PDP 11/44 and a DG 2300 system. The intention is to replace the ICL 2803 with a General Computer with a single interactive system with up to 50 terminals. The initial staff will consist of 6 persons and applications are required for the following positions which are now vacant.

COMPUTER MANAGER  
MIN K13780 - GRADES 9 - 11  
MAINTENANCE ENGINEER  
MIN K10120 - GRADES 8 - 9  
SENIOR ANALYST/PROGRAMMER  
MIN K10120 - GRADES 7 - 9

The approximate conversion rates at time of going to press (K1 = AS £2.367, 1291.876, New Pw. 6196 at 22/11/1979)

INITIAL CONTRACT PERIOD, THREE YEARS, OTHER BENEFITS INCLUDE A GRATUITY EQUAL TO 24% OF EMPLOYMENT, REPATRIATION AND LEAVE FARES. STAFF MEMBERS AND FAMILIES, SLETTING AND OUT ALLOWANCES, SIX WEEKS PAID LEAVE PER YEAR, EDUCATION FARE AND ASSISTANCE TOWARDS SCHOOL FEES; FREE HOUSING, SALARY CONTINUATION AND MEDICAL BENEFIT SCHEMES AVAILABLE.

FOR INFORMATION AND CONDITIONS OF SERVICE WRITE TO: QUOTING DEPARTMENT: THE REGISTRAR, UNIVERSITY OF TECHNOLOGY, P.O. BOX 793, LAE, PAPUA NEW GUINEA. APPLICATIONS CLOSE ON 31 JANUARY, 1980.

Colalate na hOllscole Corcalgh  
University College Cork  
**ECONOMICS**

Applications are invited for a full-time permanent post or posts as Assistant Lecturer or College Lecturer in the Department of Economics. The salary scales are: College Lecturer, £7,440 to £8,830-Bar-£8,864 to £10,581 per annum. Assistant Lecturer, £6,453 to £7,011 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

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## CHelsea College University of London

**PRINCIPAL**

Enquiries and recommendations are invited concerning the Principalship of Chelsea College which becomes vacant on 1st October, 1980, when the present Principal, Dr. G. J. E. Ingram, takes up office as Vice-Chancellor of the University of Kent at Canterbury. The closing date for applications is 2nd June, 1980. Further information may be obtained from W. G. Goss, Secretary of Chelsea College, Manresa Road, London SW3 6LS.

The College will not necessarily limit considerations to those who have applied previously.

## UNIVERSITY OF PAPUA NEW GUINEA GOROKA TEACHERS' COLLEGE

Applications are invited for the post of PRINCIPAL, ADE PRO-PRINCIPAL OF EDUCATION, to take effect from 1 January, 1981. The rank and title of Principal is a rank and title of Professor in the University of Papua New Guinea. The Principal will be a member of the University Council in recognition of the status of the Principal as a member of the University of Papua New Guinea. The Principal will be responsible for the management of the College and will be a member of the University Council. The Principal will be responsible for the management of the College and will be a member of the University Council.

For information and conditions of service write to: QUOTING DEPARTMENT: THE REGISTRAR, UNIVERSITY OF TECHNOLOGY, P.O. BOX 793, LAE, PAPUA NEW GUINEA. APPLICATIONS CLOSE ON 31 JANUARY, 1980.

## UNIVERSITY OF SINGAPORE

**University Secondments**

With the cooperation of the Inter-University Council for Higher Education Overseas, the University of Singapore is seeking to attract a limited number of senior academic staff to secondment in the field of teacher education. The successful candidate will be responsible for teaching in the following areas: science, health, social studies, and general education. The University of Singapore is seeking to attract a limited number of senior academic staff to secondment in the field of teacher education.

## THE UNIVERSITY OF WOLLONGONG Australia

**SECRETARY-MANAGER UNION**

The appointee will be responsible for the management of the Union and will be a member of the University Council. The appointee will be responsible for the management of the Union and will be a member of the University Council. The appointee will be responsible for the management of the Union and will be a member of the University Council.

## University of East Anglia Norwich

Applications are invited for the post of Secretary-Manager of the Union. The successful candidate will be responsible for the management of the Union and will be a member of the University Council. The successful candidate will be responsible for the management of the Union and will be a member of the University Council.

## THE UNIVERSITY OF WOLLONGONG Australia

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## Colalate na hOllscole Corcalgh University College Cork

**COMPUTER SCIENCE**

Applications are invited for a full-time permanent post or posts as Assistant Lecturer or College Lecturer in the Department of Computer Science. The salary scales are: College Lecturer, £7,440 to £8,830-Bar-£8,864 to £10,581 per annum. Assistant Lecturer, £6,453 to £7,011 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

## UNIVERSITY OF SYDNEY

**LECTURESHIP IN CHEMICAL ENGINEERING**

Applications are invited for a full-time permanent post or posts as Assistant Lecturer or College Lecturer in the Department of Chemical Engineering. The salary scales are: College Lecturer, £7,440 to £8,830-Bar-£8,864 to £10,581 per annum. Assistant Lecturer, £6,453 to £7,011 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

## BRADPOUR THE UNIVERSITY

**LECTURESHIP IN CHEMICAL ENGINEERING**

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## MACQUARIE UNIVERSITY Australia

**RESEARCH ASSISTANT (situated in London)**

A suitably qualified graduate is required to assist with the preparation of a book on the history of the University of Sydney. The successful candidate will be responsible for the preparation of the book and will be a member of the University Council. The successful candidate will be responsible for the preparation of the book and will be a member of the University Council.

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## UNIVERSITY OF THE WEST INDIES TRINIDAD

**GEOLOGIST**

Research Fellow/Junior Research Fellow in the SEISMIC RESEARCH UNIT with research interests in Volcanology and Seismology. Salary scales: Research Fellow, £17,500 to £22,500 per annum. Junior Research Fellow, £12,500 to £17,500 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

## EDINBURGH HERIOT-WATT UNIVERSITY

**CHAIR OF LANGUAGES**

Applications are invited for the Chair of Languages in the Department of Languages. The successful candidate will be responsible for the management of the Chair and will be a member of the University Council. The successful candidate will be responsible for the management of the Chair and will be a member of the University Council.

## BRISTOL THE UNIVERSITY

**DEPARTMENT OF CHILD HEALTH**

Applications are invited for a full-time permanent post or posts as Assistant Lecturer or College Lecturer in the Department of Child Health. The salary scales are: College Lecturer, £7,440 to £8,830-Bar-£8,864 to £10,581 per annum. Assistant Lecturer, £6,453 to £7,011 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

## HONG KONG THE UNIVERSITY

**CHAIR OF MUSIC**

Applications are invited for the Chair of Music in the Department of Music. The successful candidate will be responsible for the management of the Chair and will be a member of the University Council. The successful candidate will be responsible for the management of the Chair and will be a member of the University Council.

## BIRMINGHAM THE UNIVERSITY

**DEPARTMENT OF ENVIRONMENTAL STUDIES**

Applications are invited for a full-time permanent post or posts as Assistant Lecturer or College Lecturer in the Department of Environmental Studies. The salary scales are: College Lecturer, £7,440 to £8,830-Bar-£8,864 to £10,581 per annum. Assistant Lecturer, £6,453 to £7,011 per annum. Application form and further details of the post may be obtained from the undersigned. Latest date for receipt of applications is Monday, May 19, 1980. M. F. KELLEHER, Secretary.

## BRADPOUR THE UNIVERSITY

**LECTURESHIP IN CHEMICAL ENGINEERING**

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## UNIVERSITY OF THE WEST INDIES TRINIDAD

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### Technical Colleges

ALON GILBERT

[illegible]

**Polytechnics continued**

**BRISTOL,**  
**THE POLYTECHNIC**  
**DEPARTMENT OF**  
**ECONOMIC AND SOCIAL**  
**SCIENCE**  
**LECTURER HONORARY**  
**LECTURER IN ECONOMICS**  
**Vol. No. L31,25**  
Applications are invited from  
candidates with a good degree  
in Economics to teach on a  
range of Economic subjects in  
undergraduate and post-graduate  
teaching for career A 11

Preference will be given candidates possessing a high degree and experience of knowledge in intelligence field. A person appointed will be expected to be active in recruiting.

Quota to commence September 1, 1960.

Salary Scale: \$4,810 to \$7,000 per annum.

For further details and application form, in return for which a recent photograph and Personnel Office Form 105 (1959) should be submitted, apply to the Agency, Bristol Road 117, Freetown, or write to your nearest number in all communications.


**Higher Education Dublin**  
**Teachas Baile Átha Cliath**

in scopes this will be  
tion to the needs, both current  
and of Irish industry, business  
will place heavy emphasis on

pointment as:

**chool of**  
**al Sciences**

for review and is expected to  
Details will be available to  
  
details are available from:  
Ministry for Higher Education,  
Cabin 2, Tel. 765173

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Education  
**LAW**  
**LAW**  
required for BA(Hons) Law  
work essential

details available from the  
Ministry of Higher Education,  
P.O. Box 111, to whom  
14 days of the date of  
91, extension 221.











